

# Calibrating, extending, and applying the Nueces Delta Hydrodynamic Model

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# Goals

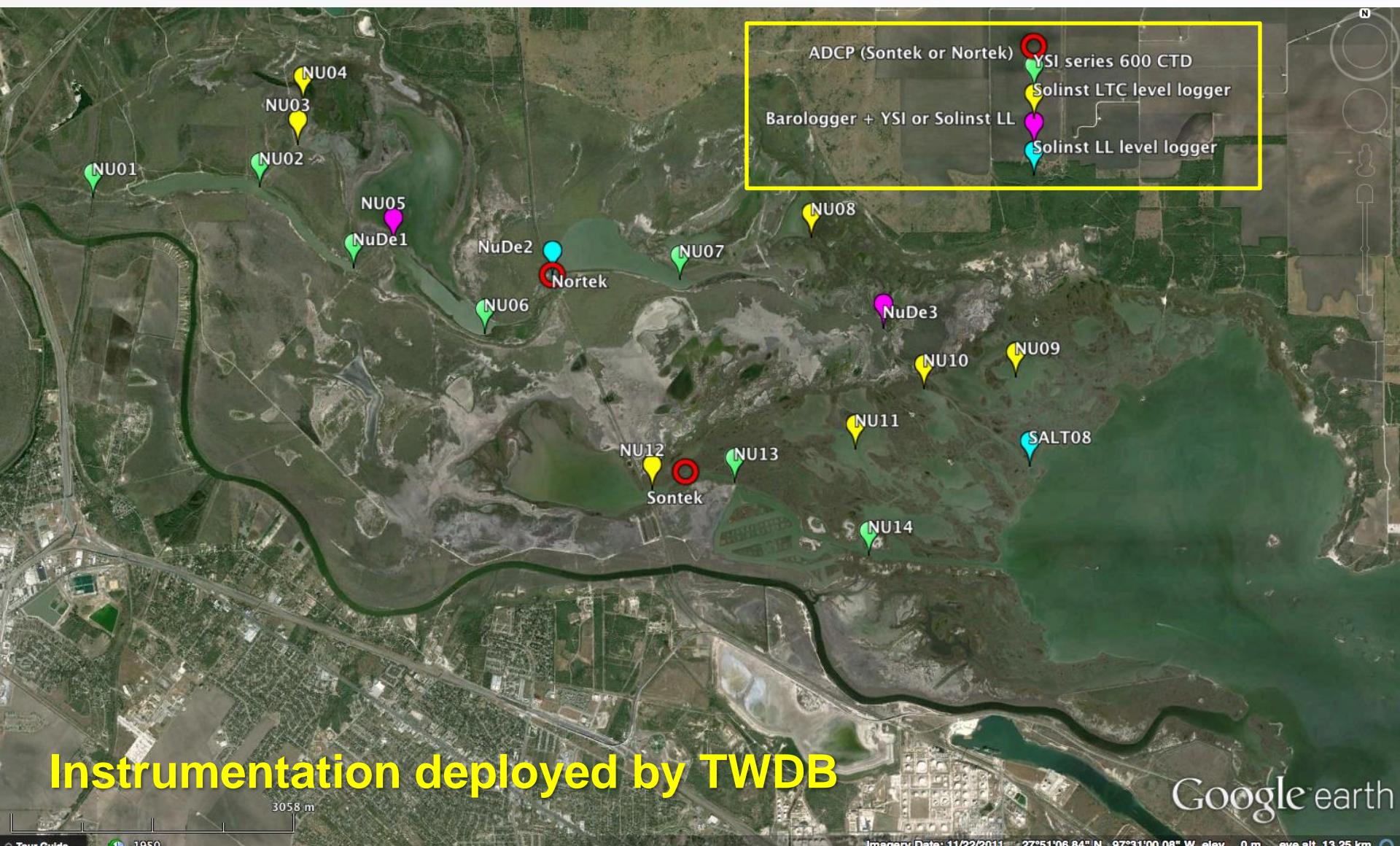
- Model that can predict time-space changes in the salinity distribution from Calallen dam out to the Nueces Bay Causeway
- Understanding of pumping effects for different flow rates under different tide/wind conditions

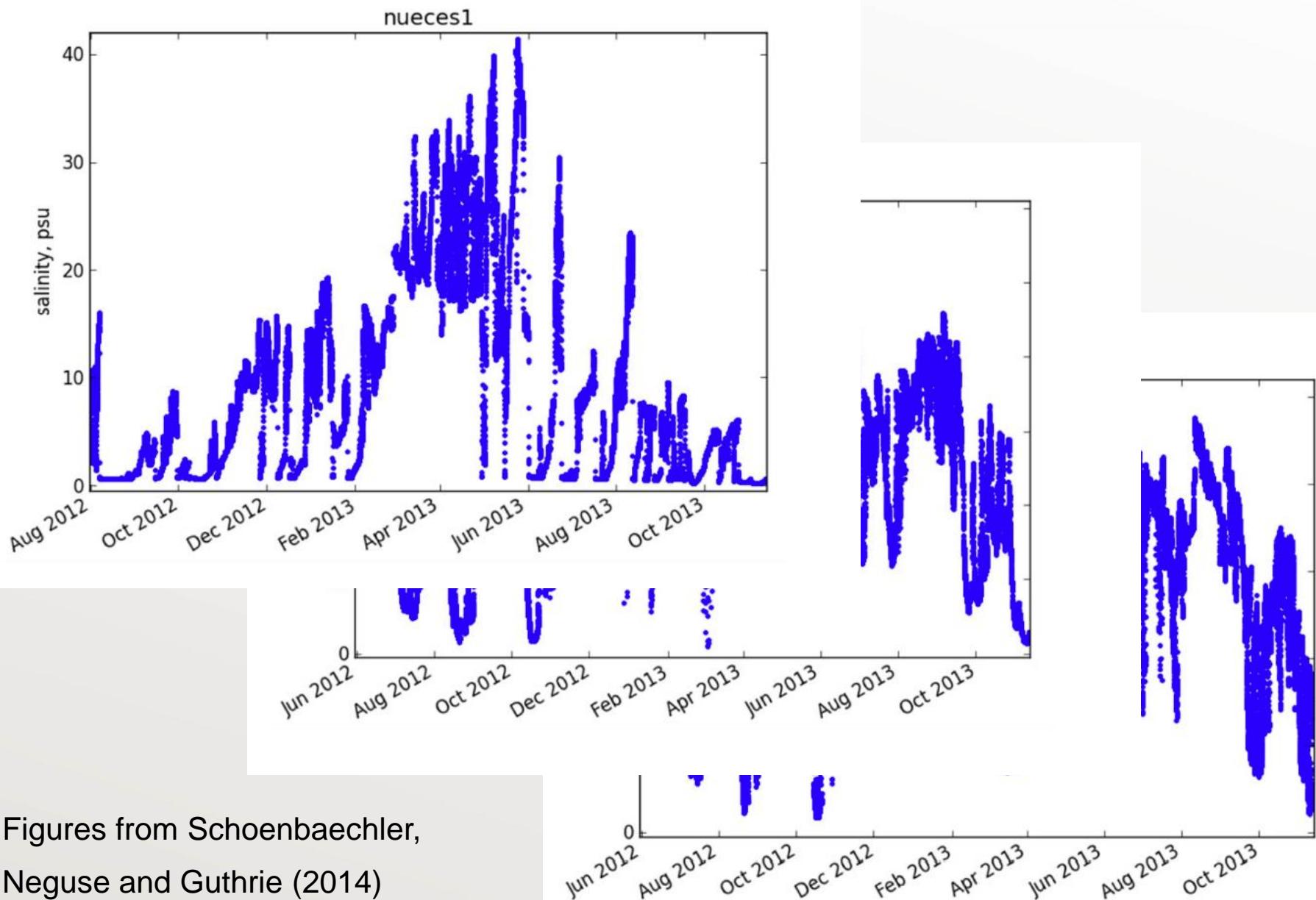
# Tasks

- Calibrate Nueces Delta hydrodynamic model
- Add Nueces Bay to model
- Evaluate freshwater pumping scenarios

# Calibration

- TWDB installed 38 instruments in Nueces Delta from July 2012 through Nov 2013
- Data sets are water level, temperature, and conductivity (salinity) collected throughout Delta
- Water velocity data using ADCP at two locations
- Calibrating to this data set should provide confidence in the model.

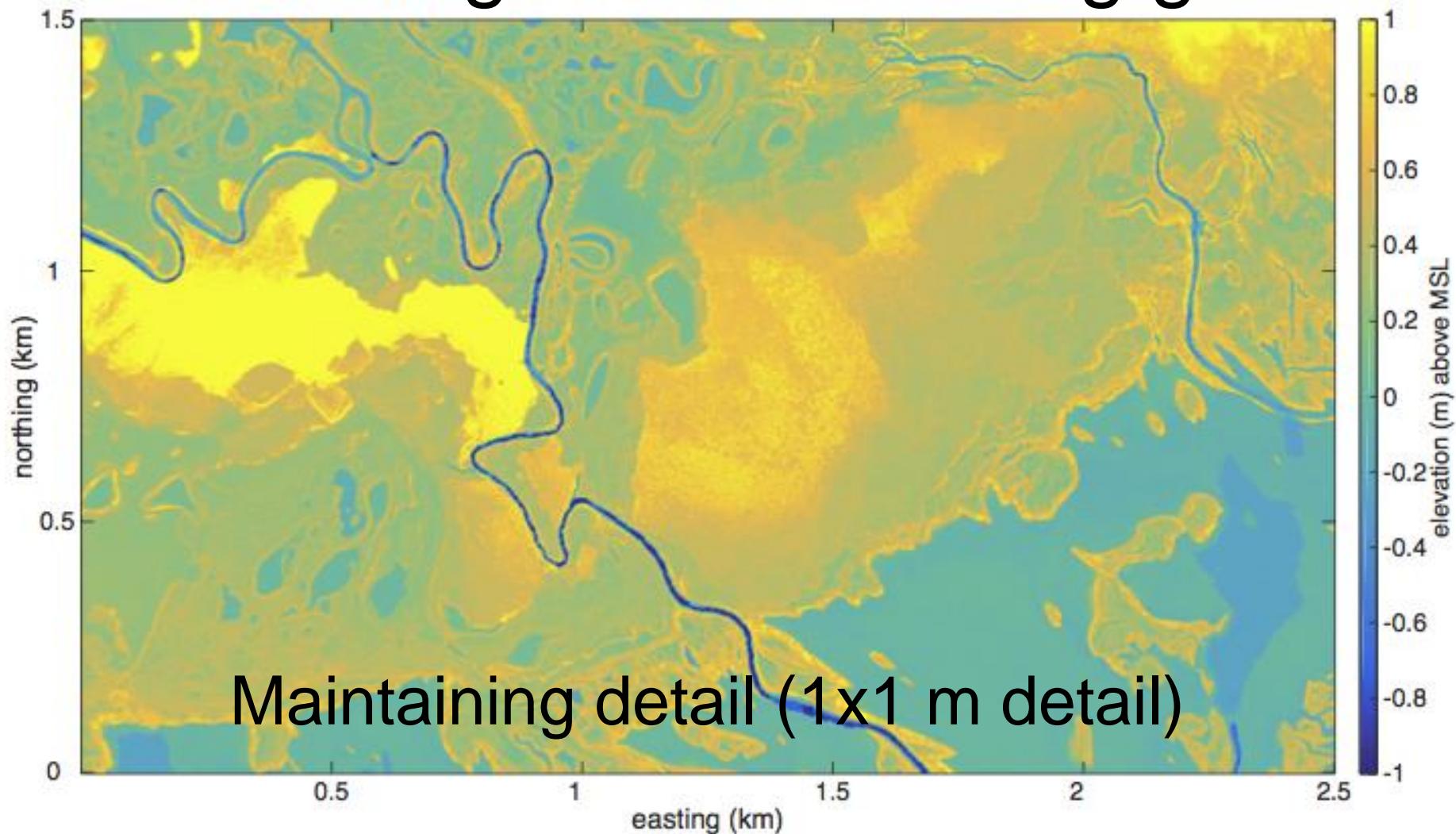




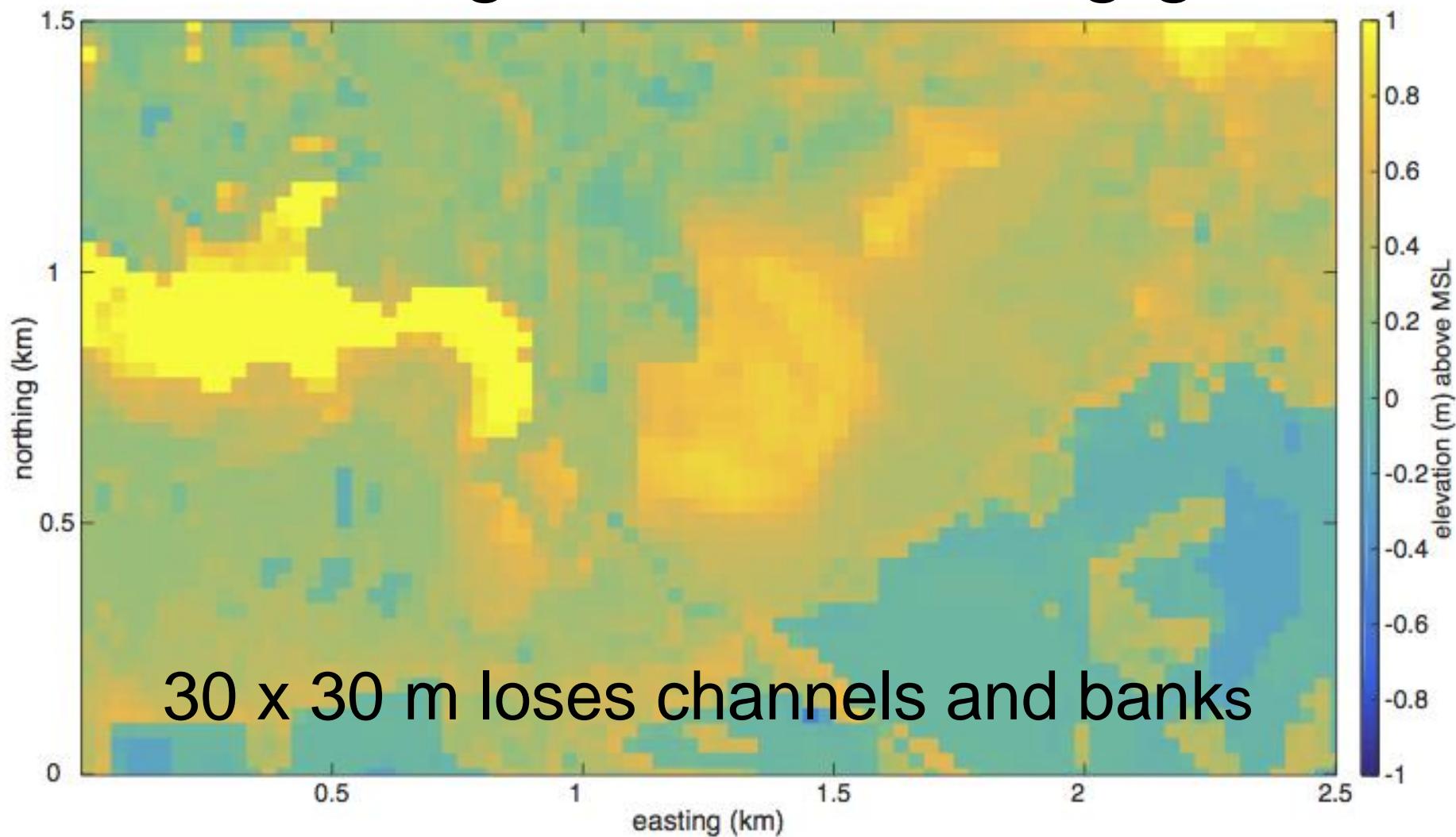
# Summary of work to date

- Calibration is still in progress.
- Previous model used  $15 \times 15$  m grid.
- Coarsened grid to  $30 \times 30$  m to speed calibration and work with Nueces Bay model.
- Developing bathymetry for complete system.

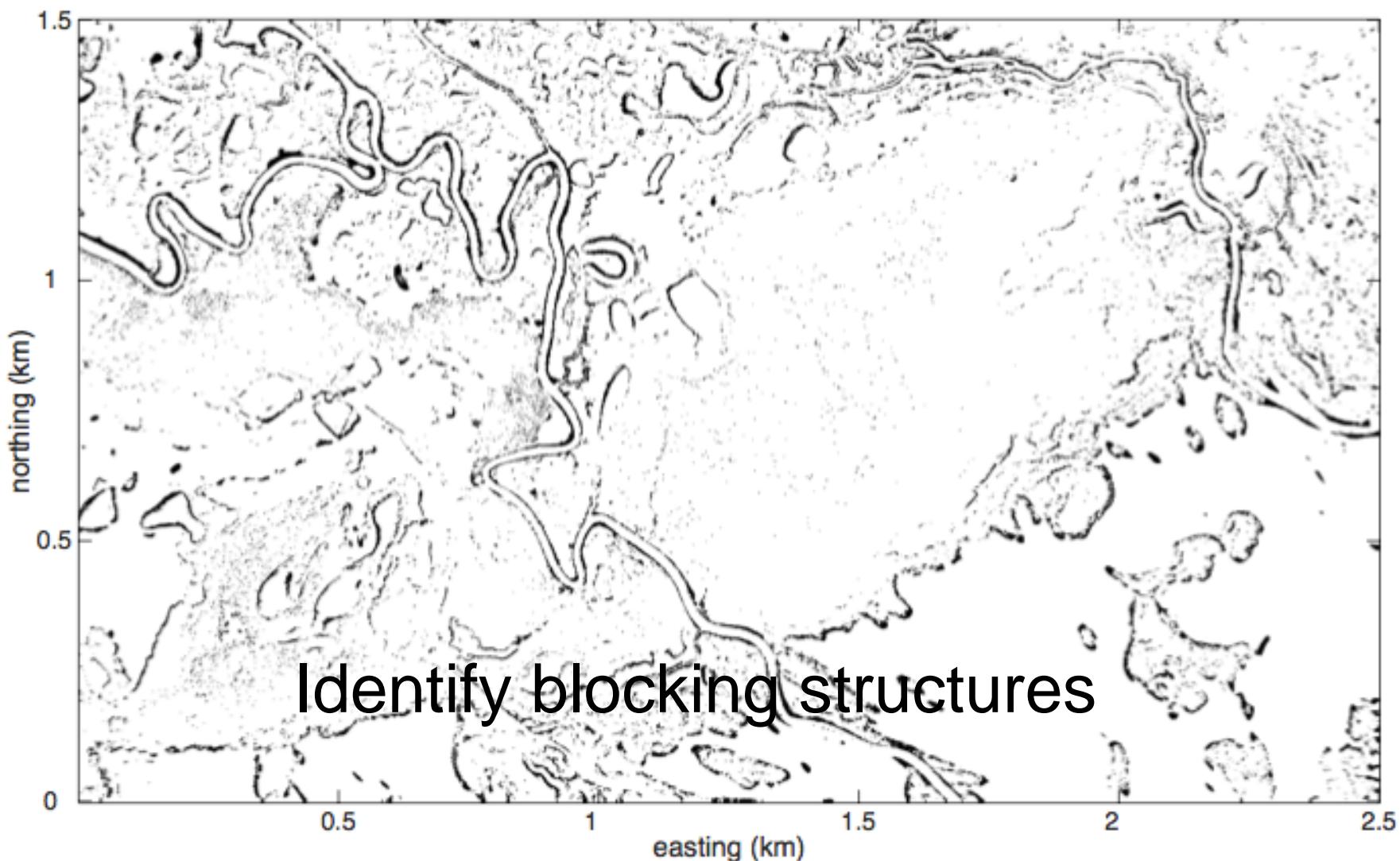
# Challenges in coarsening grid



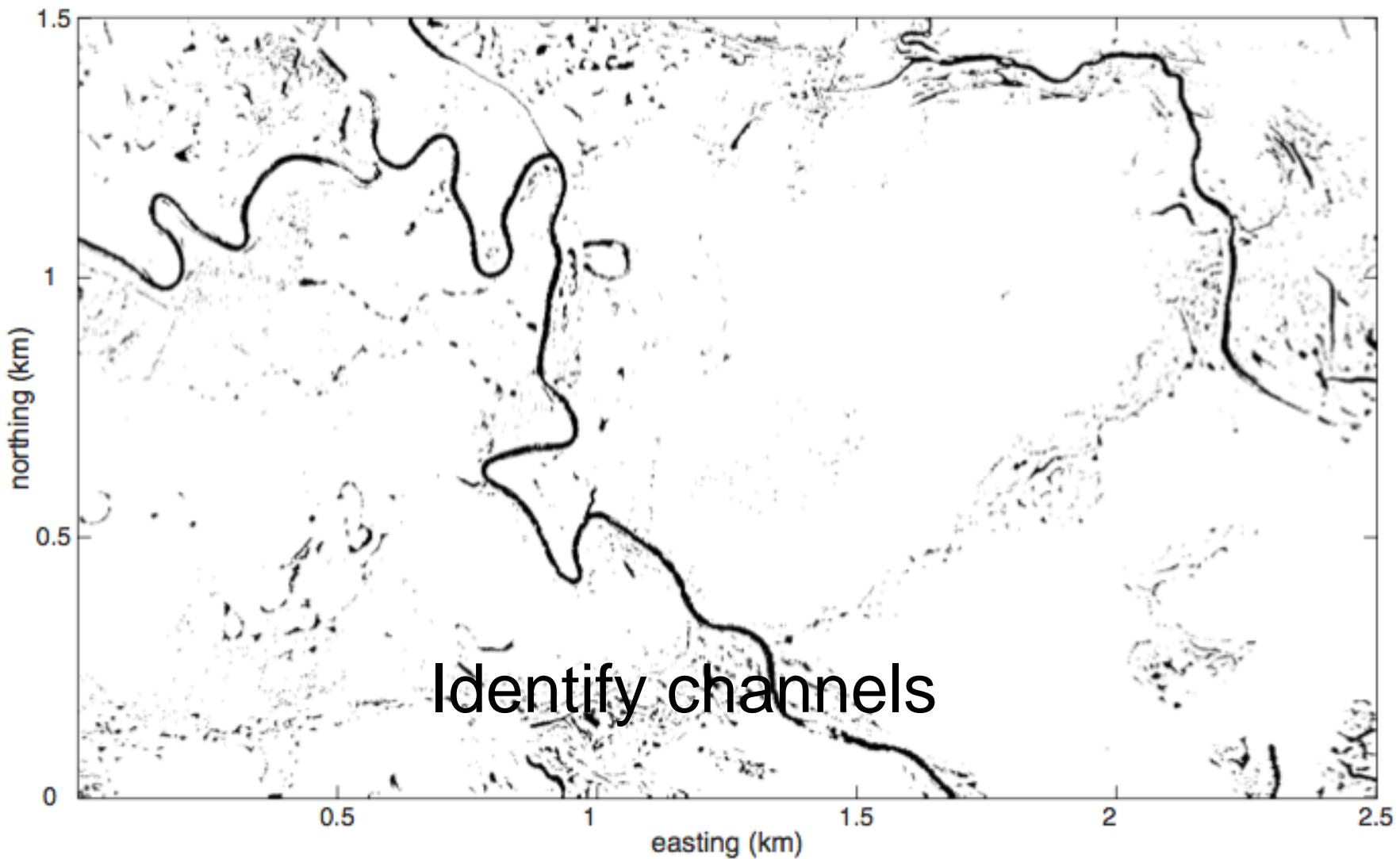
# Challenges in coarsening grid



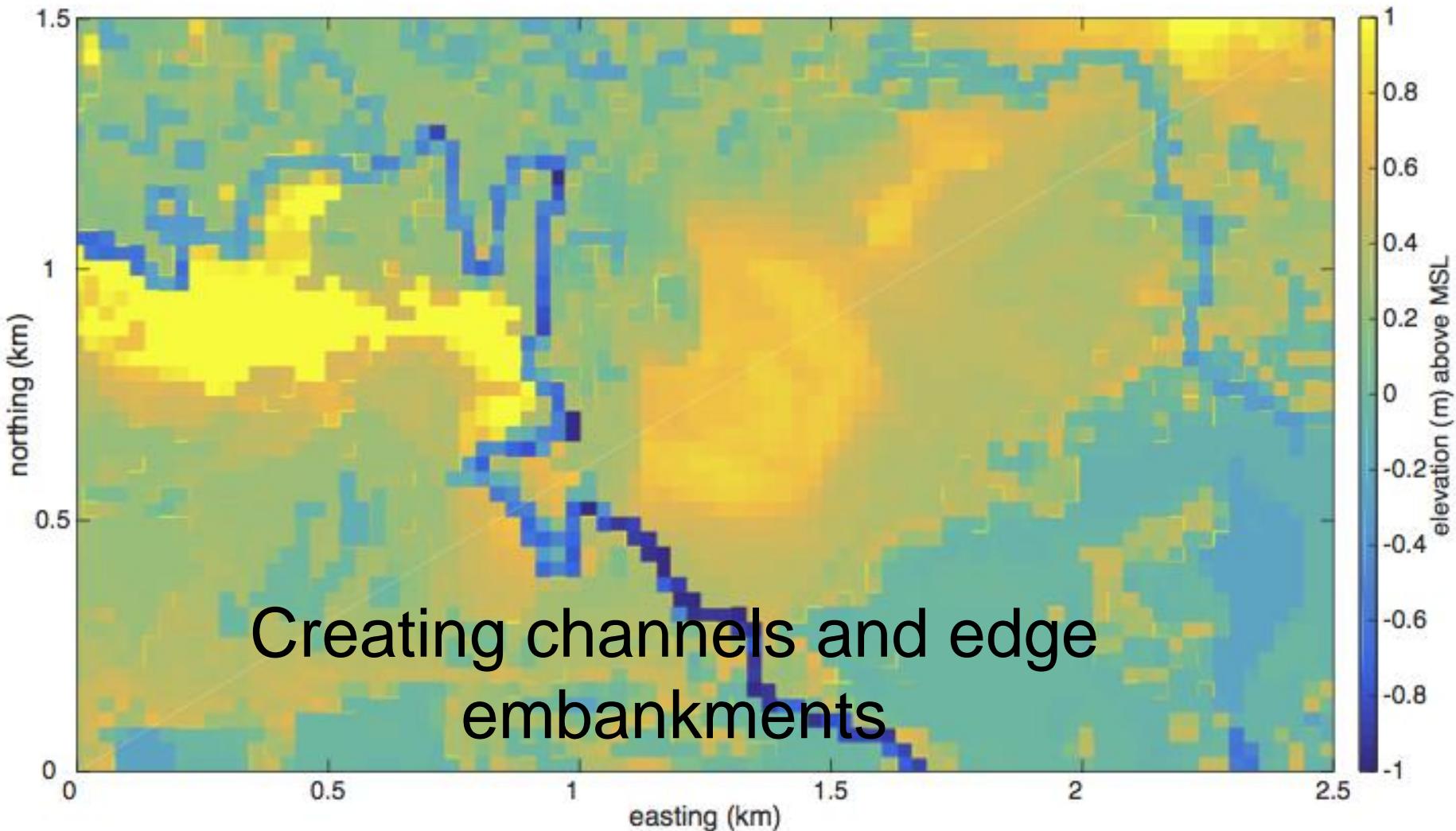
# Challenges in coarsening grid



# Challenges in coarsening grid



# Challenges in coarsening grid



# Calibration

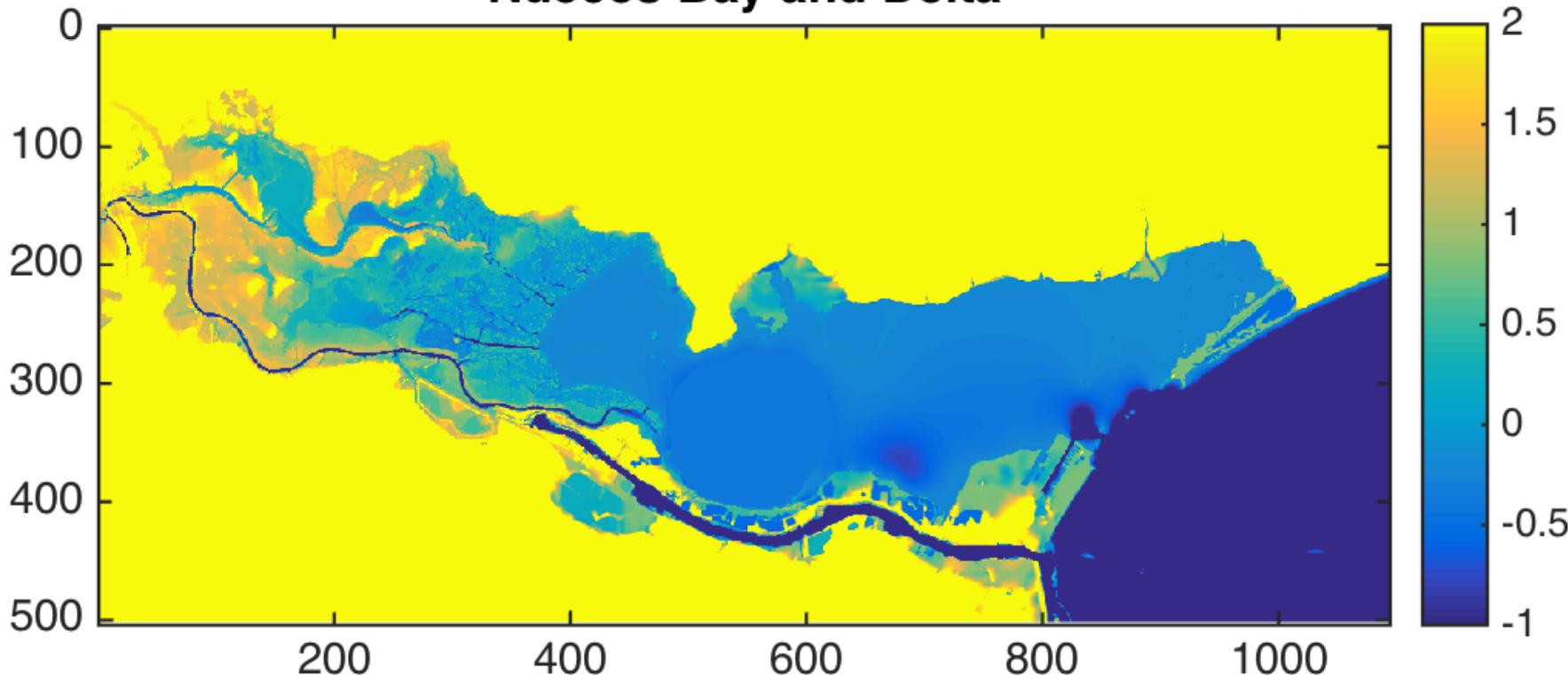
- Adjusting drag coefficients in channels,
- Minimum channel size (30 m) is wider than many channels, so we need increased drag to slow flows.
- Critical issues are at several choke points within the Rincon bayou that control flow paths.

# Adding Nueces Bay

- Present model uses Nueces Bay as a “dummy” domain to enforce tides.
- New model will have dummy domain outside of Nueces Bay Causeway for tidal conditions.
- We don’t have the same detail of bathymetry for Nueces Bay that we do for the Delta (shouldn’t be a problem).

# Adding Nueces Bay

Nueces Bay and Delta



550,000 grid cells at 30 x 30 m

# Movies of preliminary model results

Model results using Aug. 2012 wind, tide, and freshwater pumping. Initial salinity field based on sensors in Nueces Delta

- Salinity: <http://youtu.be/N1Zyziul1m0>
- Elevation: [http://youtu.be/ankf\\_ecQQpY](http://youtu.be/ankf_ecQQpY)

Model results starting from uniform salinity field of 35 ppt and tidal inflow that is always 35 ppt. These results allow us to more easily see the fate of the pumped freshwater.

- Baseline
- Project 2 <http://youtu.be/XqUpTzQbI7Q> blocking Upper Rincon.
- Project 3 <http://youtu.be/uAvc8Gi0RLg> providing Upper Rincon control structure and channel to South Lake.
- Project 4 <http://youtu.be/DKC4EvqlOcw> providing Middle Rincon control structure and channel to South Lake.
- Project 5 <http://youtu.be/mFTeLKWxnac> providing North Lake to South Lake channel (no control structure)

My thanks to TWDB, CBBEP, NEAC, and the Nueces BBASC for funding and the opportunity to continue this work.

And also to TWDB and the USACE for the great data collection program.

...and that's all, folks!